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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/821,368
Filing Date: April 09, 2004
Appellant(s): MIYAKI ET AL.

Anne K.W. Sutton
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed November 20, 2010 appealing from the Office action mailed June 1, 2010.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:

Claims 1, 3, and 4 are pending and rejected. Claims 2 and 5 have been previously canceled.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the

subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

EP 074921	FUJIMOTO	3-1996
WO 01/29918	IKEDA	4-2001
US 7241533	IKEDA	7-2007

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 1 and 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 0704921A1 (Fujimoto et al.) in view of WO 01/29918 (Ikeda et al.). (Note: US 7241533 is being relied upon as an English translation for WO 01/29918, both of which stem from PCT/JP00/07297). **Note: For purposes of appeal, a certified translation for Ikeda et al. has been obtained. The portions relied upon in Ikeda et al., as corresponding to the certified translation will be in bold and denoted using "//"**

following the same relied upon portion in the US equivalent, which was originally relied upon.

As to claim 1, Fujimoto et al. teaches a cylindrically wound battery, where the electrode material mixture (both positive electrode, cathode, and negative electrode, anode are included) is present on both the inner and outer sides of the current collector (abs). Furthermore, the negative electrode active material is chosen such that the efficiency of lithium intercalation and deintercalation is high (p3, lines 37-39). The compounds used in the negative electrode materials are from groups IIIb, IVb, and Vb of the periodic table. One specific formula of the active material used is $SnSi_tP_uAL_vO_s$ represented by formula (V) (p4, line 50) (both tin and silicon containing). Furthermore, the use of tin monoxide and silicon dioxide is exemplified in the synthesis examples 1-5 (p7-8).

It is again emphasized that Fujimoto et al. appreciates tin-silicon oxide materials, as seen in several examples under synthesis example 1 (p7, lines 1-30). It is noted that crystallinity and lack thereof (wherein a lack of crystallinity indicates amorphousness) is discussed. It is stated that a crystalline structure has a diffraction line between $2\theta=40°$ to 70° (p7, lines 7-14). As seen in the appreciated examples, either crystallinity is present (wherein B/A >0, as B is defined as the diffraction line measure), or crystallinity is not present (indicating no crystallinity and thus amorphousness). For example, the appreciated compound at 1-G at p7, line 20 is $SnSi_{0.5}Pb_{0.5}O_3$, wherein B/A=0.3, which indicates crystallinity. Additionally, example 1-Q at p7, line 30 is $SnSi_{0.9}O_{2.8}$, wherein B/A=0, which indicates no crystallinity (amorphousness). It is noted that such structures

showing crystallinity is interpreted to be microcrystalline, as crystallinity exists and particle sizes are defined using micrometers, thus indicating a micro-sized scaling (i.e. the average particle size is 4.5 µm for synthesis example 1, as seen on p7, line 6). This interpretation is taken barring specification as to what constitutes microcrystalline. Office personnel are to give claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Also, limitations appearing in the specification but not recited in the claim are not read into the claim. See *In re Zletz*, 893F.2d 319, 321-22,13 USPQ2d, 1320, 1322 (Fed. Cir. 1989). In such a manner the Si or Sn compounds are either amorphous or microcrystalline.

It is furthermore noted that Fujimoto et al. teach of average particle sizes of its negative active material. For example, a tin-silicon-oxide (negative active material) of synthesis example 1 has an average particle size of 4.5 µm (which falls into the particle diameter size as claimed, 0.1-35 µm) (p7, lines 3-6). Although it is not specifically stated that all of the particles fall within the claimed size, Fujimoto et al.'s teaching of embodied average particle sizes would at least render obvious the use of particles of such a size, as such a size is specifically noted. Accordingly, one of ordinary skill in the art would find it obvious to make the negative active material having a size of 4.5 µm, as Fujimoto et al. specifically embodies such a desired size, wherein the use of active material of this size would have provided the predictable result of creating a working battery. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to make a battery with an active material

having a size of 4.5 µm (and sizes close to that), as Fujimoto et al. specifically embodies negative active material with particles having such an average size, and thus the use of active material particles of such a size within a battery would yield the predictable result of forming an operating battery. Furthermore, it is noted that particle sizes of active materials are seen as result effective variables, as particle sizes would affect physical characteristics that would help optimize battery operation. For example, particle sizes would alter things such as surface area of the active material available for chemical reaction, packing density (amount of active material within the anode available for chemical reaction as well as porosity, which would allow for ion transport). It would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the size of the particle size (i.e. to between 0.1-35 µm), since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has been held that discovering that general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,*105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

As previously stated, the battery of Fujimoto et al. is cylindrical (p2, lines 48-49). NOTE: A cylinder inherently has a circular cross section (sectional surface shape), as is

defined by the constraints of a cylindrical volume. A circle is a special type of ellipse; in an ellipse that is a circle, the longest diameter to the shortest diameter is 1:1 (or 1, inclusive, as claimed by the instant application). Furthermore, it is listed that the thickness of electrode material mixture on the inner side of the collector is from 60% to 97%, more preferably 70% to 95%, of the outer collector. The difference in thickness inherently provides a difference in capacity, as the thicker layer contains more active material, and thus has more capacity. In Fujimoto's teaching, the ratio ranges of capacity of the outer active material to the inner active material would be from 1:0.6 to 1:0.97, inclusive, more preferably 1:0.7 to 1:0.95, inclusive. A portion of Fujimoto et al.'s range covers the claimed ratio, and therefore would inherently provide the same claimed ratio difference.

Alternately, it can be said that Fujimoto et al. do not disclose the specific capacity ratio of the outer anode active material to the inner active anode material that is from 1:0.6 to 1:0.8, inclusive. However, it has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). Claims that differ from the prior art only by slightly

different (non-overlapping) ranges are prima facie obvious without a showing that the claimed range achieves unexpected results relative to the prior art. (In re Woodruff, 16 USPQ2d 1935,1937 (Fed. Cir. 1990)). Selection of optimum ranges within the prior art's general condition is obvious. (In re Aller, 105 USPQ 233(CCPA 1955)).

Fujimoto et al. does not teach that the anode current collector is made of a plurality of layers including an inner current collector layer and an outer current collector layer.

Two portions of Ikeda et al. are relied upon to render obvious the use of two types of plural layered current collectors.

(1) Ikeda et al. teach of a rechargeable lithium battery where current collectors having layers of active material provided on opposite faces thereof may be prepared from two current collectors each having a layer of active material on its one face by joining the back faces to each other (thus resulting in a two layered current collector with active material on either side) (col. 6, lines 40-45//**p11, lines 26-30**). One having ordinary skill in the art at the time the claimed invention was made would have found it obvious to create a current collector with active material on both sides, as disclosed by Ikeda et al., since such a known method of forming a current collector with active material on opposing sides would yield the predicable result of having a similar structure (active material on both sides of a current collector, whether the current collector is one or two layers), which would have operated in the same manner. Accordingly, it is seen that whether a current collector is a single layer (as embodied in the primary reference, Fujimoto et al.) or plural layers (as taught by Ikeda et al.) lacks criticality, as both would

yield the same result of having electrode active material coated on both sides of a current collector for use in a battery. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the single layered current collector with active material on both sides with a current collector with plural layers wherein active material is on both sides, as Ikeda et al. teach that such a method is known to make a current collector with active material on both sides, and the application of such a method would yield the predicable result of having a similar structure (active material on both sides of a current collector, whether the current collector is one or two layers), which would have operated in the same manner within a battery.

(2) Ikeda et al. teach of current collector made of a metal foil, wherein an interlayer may be provided on each face of the current collector, wherein the interlayer is what faces the active material (col. 2; lines 58-64//**p5, lines 31-37**). In such a manner, it can be interpreted that the composite collector of Ikeda et al. includes the current collector and inter layer on each side (wherein such a final product has a battery wherein the anode active material is on both sides of the composite anode current collector having the plurality of layers defined above). The motivation for using a plural layered composite collector (interlayer-current collector-interlayer) is in order to provide the current collector in the form of a foil that is high in mechanical strength while providing interlayers that are made of materials that can be alloyed with the active material to enable diffusion of the interlayer components into the active materials (col. 2, line 58 to col. 3, line 7//**p5, line 31 to p6, line 5**). The motivation for wanting use a plural layered

composite current collector (as taught by Ikeda et al. and applied to Fujimoto et al.) is to provide a stronger composite current collector that still is capable of alloying with the active materials (col. 2, line 58 to col. 3, line 7//**p5, line 31 to p6, line 5**). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use the plural layered composite current collector (interlayer-current collector-interlayer), as taught by Ikeda et al. in the battery of Fujimoto et al. in order to impart good mechanical strength of the composite collector and good alloying capabilities between the composite collector and the active materials.

As to claim 3, Fujimoto et al.'s outer anode active material layer and the inner anode active material layer are inherently alloyed with the current collector, because the tin used in the exemplified in the anode active material is able to be alloyed with the exemplified anode current collector (copper, as is used in example 1 on p12, lines 22-26).

As to claim 4, in example 1 of Fujimoto et al., a negative electrode material is prepared via dispersion and applied to the current collector (p12, lines 22-26). This application is a liquid-phase deposition.

(10) Response to Argument

Argument A – Fujimoto does not teach or suggest the claimed ratio.

Argument A1 – Appellant argues that Examiner's arguments on why the ratios required by the claims would be considered result-effective variables are mere speculation and conjecture and relies upon Ex Part Belau (wherein the Board held that a reference did not disclose any relationship between the sensors,

wherein Examiner has not provided evidence to establish that changes in the ratio were known to change a specific result).

Examiner respectfully disagrees with Appellant's position and submits that Appellant has misunderstood the rejection of record. First it is submitted the position with respect to result effective variables are not directed at the capacity ratio. Thus such arguments are irrelevant, as they are not commensurate in scope with the rejection. The position with respect result effective variables is directed at particle sizes (wherein Fujimoto teaches of an average particle size that falls within the claimed particle size range but not the fact that all particle sizes fall within a specific size). The position taken is that the teaching of a preferred average size at least would render obvious having all particles of the average particle size. With respect to such a size being a result effective variable, it is submitted that reasons as to why particle size is a result effective variable has been set forth in the rejection, reiterated herein for clarity's sake: “Furthermore, it is noted that particle sizes of active materials are seen as result effective variables, as particle sizes would affect physical characteristics that would help optimize battery operation. For example, particle sizes would alter things such as surface area of the active material available for chemical reaction, packing density (amount of active material within the anode available for chemical reaction as well as porosity, which would allow for ion transport).” Appellant has not provided any reasoning or proof to the contrary, as to why one of ordinary skill would not expect particle size to affect physical characteristics set forth within the rejection and reiterated above (i.e. why wouldn’t one of ordinary skill in the art appreciate the fact that larger

particles have more surface area available for reaction, or that smaller particles allow for more particles to be put in a certain volume/area giving more material for reaction?). Additionally, it is submitted that at the very least Fujimoto et al. specifically embodies such a desired size, wherein the use of active material of this size would have provided the predictable result of creating a working battery. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to make a battery with an active material having a size of 4.5 µm (and sizes close to that), as Fujimoto et al. specifically embodies negative active material with particles having such an average size, and thus the use of active material particles of such a size within a battery would yield the predictable result of forming an operating battery. Appellant has failed to identify why a desired size average particle size would not render obvious the application of that size to all of the particles with a predictable result of having active material that acted in the same manner. "When considering obviousness of a combination of known elements, the operative question is thus "whether the improvement is more than the predictable use of prior art elements according to their established functions." *Id* . at ___, 82 USPQ2d at 1396." See MPEP §2141(I). Accordingly, it submitted that the argument above is not applicable to the rejection of record as (a) Appellant has mischaracterized the application of the result effective variable reasoning, applying it to the claimed ratio, wherein the rejection clearly does not state that the claimed ratio is a result effective variable and (b) that the portion of the rejection that relies on result effective variable (size) clearly has reasoning as to why it would be a result effective variable in addition to why such sizes would be obvious.

Thus such arguments are not found to be persuasive, and the rejection of record is maintained.

Argument A2 – Appellant argues that a coating thickness is not the same as the capacity ratio of the claims.

Examiner respectfully disagrees. This is merely a conclusory statement, wherein Appellant has not provided any clear proof, showing, or reasoning to the contrary. Clarification to Examiner's reasoning to inherency/obviousness is set forth below. The same amount of the same material should have the same capacity. (It is noted that only one negative material is seen to be formed for a battery, as synthesis is only of one material is applied to both sides of the collector —see p 3, lines 5-10 for the thickness ratio of electrode material; see p 12, lines 22-26 for the fact that the same material is applied to both sides). In such a manner, the thickness of the electrode material is indicative of the ratio of electrode material (as the thicker the material is, the more material there is, the higher the capacity), wherein given the same material and same electrode, the difference in amount lies in thickness. Thus such a relationship between thickness relates to the amount of material, wherein a proportional relationship would be expected (as more material relates to more capacity). Again, it emphasized, as the material is being applied to the same collector, two out of the three dimensions of the material are the same (length (l) and width (w)). Thus the volumetric amount of one side would be (l*w*t1), while the volumetric amount of the other side would be (l*w*t2) (wherein t stands for the different thicknesses). Thus the amount of material present is proportional to the thicknesses. In such a manner, one would expect capacity,

dependent on the amount (thus the ratio therein), to provide the same proportional relationship (or at the very least have an amount/ratio close to that of the proportion set forth by the thickness). Again, it is submitted that Appellant has not provided any proof to the contrary, thus the arguments are not found to be persuasive, and the rejection of record is maintained.

Argument A3 – Appellant argues that coating thickness is not the same as capacity ratio, as capacity ratio is defined per cm^2 in the specification.

Examiner respectfully disagrees. It is submitted that such a limitation is not in the claim language. In response to Appellant's argument that the references fail to show certain features of Appellant's invention, it is noted that the features upon which Appellant relies (i.e., that the capacity taken is per unit area) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Furthermore, it is noted that the ratio of one capacity to another (regardless the basis - area, volume, thickness) would still be unitless. Furthermore, it is submitted even if a unit area comparison was taken, the proportion (as set forth in the response to argument A2) would still exist, as two of the dimensions of active material are the same (length and width, as defined by the current collector area). Thus a comparison of area l*t1 vs l*t2 or w*t1 vs w*t2 yields the same proportion of t1 vs t2 (as applicable to the amount and thus capacity). Thus the arguments are not found to be persuasive, and the rejection of record is maintained.

Argument A4- Appellant argues that the Examiner has not pointed to any ratio, relationship, or specific in Fujimoto that shows otherwise.

Examiner respectfully disagrees. It is submitted that the ratio of thickness taught in Fujimoto et al. (p3, lines 5-10) has been likened to the capacity ratio relationship. Reasoning to this has been set forth within the rejection and clarified in the response to Arguments A2 and A3 (incorporated herein but not reiterated in full for brevity's sake). However, Examiner would like to reemphasize the position taken, giving a non-limiting example with concrete numbers in order to help illustrate the point. Given the same material, the same amount of the same material would have the same capacity. Thus when amounts of the same material are provided on the same current collector, the current collector defines 2 dimensions (length (l)= 1 cm; width (w)= 1 cm). The thickness is the only difference (using the 60% thickness appreciated by Fujimoto, thickness 1 (t1) = .6 cm, thickness 2 (t2) = 1 cm, wherein .6 cm is 60% of 1 cm). Accordingly, comparing the two amounts whether it be thickness (cm .6 vs 1), area (cm^2 .6*1 vs 1*1), or volume (cm^3 .6*1*1 vs 1*1*1), the ratio of the amount is .6 to 1, and thus one of ordinary skill would expect that the capacity (based on the amount, as the same amount of the same material would yield one capacity, and thus 10% less would have 10% less capacity, etc.) would be the same (or at the very least close to the same). Again, Appellant has failed to provide any proof to the contrary. Thus the arguments are not found to be persuasive, and the rejection of record is maintained.

Argument A5 – Appellant argues that other factors (such as density of the active material and grain diameters) can impact capacity.

Examiner respectfully disagrees. Appellant is stating that it "can" impact capacity. However, this is not proof that it indeed affects capacity. Additionally, it is submitted even if the density of the active material and the grain diameters affect capacity, as the same material is used on either side of the collector, they would have the same affect (see p 12, lines 22-26 for the fact that the same material is applied to both sides). Accordingly, such an argument is irrelevant to the rejection of record, as the same material is used, and thus any affects of the physicality of that material (density, diameter) would be the same and have the same affect. Thus the arguments are not found to be persuasive, and the rejection of record is maintained.

Argument B - The claimed capacity ratio is not obvious

Argument B1 – Appellant argues the same as above (that coating thickness and capacity ratio measure two different values), and thus the differences would be in both the measured value and required range, and concludes that obviousness is not established due to the fact that the difference in the prior art and claimed invention is more than just a range or variable.

Examiner respectfully disagrees. As set forth in the response to arguments A2-A4 above that coating thickness clearly draws to the capacity ratio (via the amount). Accordingly, the capacity can be express using thickness. Thus it is submitted that although two different values are measured, the results of the same value would either be the same or at the very least very close to the same. Thus the arguments are not found to be persuasive, and the rejection of record is maintained.

Thus the claimed invention is not held to be patentably distinct from the teachings of the prior art references relied upon in the rejection, and the rejection should stand.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Eugenia Wang/

Examiner, Art Unit 1726

Eugenia Wang

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